Zero Retries issue 0140 2024-02-23

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 1300+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - https://www.zeroretries.org/p/zero-retries-0140

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Hamvention 2024, Ho!

Hamvention 2024 in Xenia, Ohio, USA countdown - ~~*19*~~ ~~*18*~~ ~~*17*~~ ~~*16*~~ ~~*15*~~ ~~*14*~~ ~~*13*~~ *12 weeks!*

Yeeks these weeks are going by fast!

Zero Retries Guide to Interesting Conferences Updated

My thanks to Pseudostaffer Jeff Davis KE9V for a pointers to a couple of Zero Retries Interesting microwave conferences that justified an update to that page.

It’s great to have you blogging again Jeff!

ARDC Community Meeting is Saturday 2024-02-24 @ 10:00 Pacific

Via email from ARDC:

> The next ARDC Community Meeting is Saturday, February 24, 2024 at 1800 UTC (10 am PST, 1 pm EST, 6 pm GMT, 7 pm CET).
>
> You can find Zoom information for the meeting below.
>
> Looking forward to seeing you and to sharing even more information on Saturday!
>
> 73,
>
> Rebecca KO4KVG
>
> ---
>
> ZOOM INFO
>
> https://us02web.zoom.us/j/85231994557?pwd=cFVVSS9Ea25ZN092cFZ6RjMrWDk5dz09
>
> **Meeting ID:** 852 3199 4557
>
> **Passcode:** 604443

I'll be on the road for this one, so I'll dial in on the phone and mute. I hope that there will be an actual announcement of the 44Net VPN service.

FCC Docket 16-239 ("Amateur Baud Rate") - Nothing Heard To Date

At least once per week, I take a look at Docket 16-239 to see if perhaps the FCC quietly slips a decision into the record.

To date, nothing heard (nothing new in the record) since the last Reply Comment was filed 2024-01-23.

I hope, *I hope*, ***I hope***, ***I HOPE***… that the FCC accepts the recommendation in the majority of the comments eliminate the symbol rate limitations (likely) and the maximum bandwidth limitations (hopefully) currently applied to US Amateur Radio VHF / UHF bands.

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Amateur Radio and the Growth of the Spectrum Workforce in the US National Spectrum Strategy

By Steve Stroh N8GNJ

I've completed a considerable document - **Amateur Radio and the Growth of the Spectrum Workforce in the US National Spectrum Strategy**. It adds context (and considerable "cleanup") of the transcripts of the NTIA Spectrum Policy Symposium that appeared in the two previous issues of Zero Retries. I created it as a standalone document on the Zero Retries website rather than a special issue of Zero Retries, which would appear in the list of Zero Retries issues for a while and then age out in chronological order.

For future reference, on the top bar of **Zero Retries**, click on **Zero Retries Guides**, and it's linked there.

Document Introduction

> **Zero Retries** is an independent newsletter by Steve Stroh N8GNJ that promotes technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology.
>
> What follows are excerpts from the [Biden-Harris Administration] **National Spectrum Strategy (NSS)**, which was published 2023-11-13, and the US National Telecommunications and Information Administration (NTIA)'s **2024 Spectrum Policy Symposium**, which was held 2024-02-01 that are relevant to US Amateur Radio and the mission of Zero Retries… and the perspective of Zero Retries Editor Steve Stroh N8GNJ.
>
> As such, the following may provide an incomplete perspective of the totality of the NSS and the information and perspectives provided at the 2024 Spectrum Symposium. Thus, links to the NSS and the Symposium video recordings are provided for those that wish to "dive deeper" than this focused perspective.

Document Primary Takeaway

Here's the primary takeaway (excerpt) of the document that's relevant to Amateur Radio and Zero Retries readers:

Relevance of Pillar Four of the National Spectrum Strategy to US Amateur Radio

The discussion of Pillar 4 of the [Biden-Harris Administration] National Spectrum Strategy…

> Pillar 4 Panel Discussion: Growth of the Spectrum Workforce, Increased Understanding of spectrum, and Raised Awareness of spectrum's Importance to the Country

… directly relates to the utility, and perhaps the importance of Amateur Radio - ***if*** *the need for rapidly growing the "Spectrum Workforce" is* ***truly*** *considered important and urgent.)*

The concept of "growing the "Spectrum Workforce" is enshrined into US Federal Communications Commission (FCC) Regulation **§ 97.1 - Basis and**

purpose:

> The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:
>
> (a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.
>
> (b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.
>
> (c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.
>
> (d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.
>
> (e) Continuation and extension of the amateur's unique ability to enhance international goodwill.

Note particularly (b), (c), and (d).

It's understated and often overlooked, but note this key phrase, with relevance to the discussion of "Pillar 4 of the NSS":

> … a voluntary noncommercial communication service

Individuals become involved in Amateur Radio (and related radio technology hobby activities) purely on a voluntary basis, out of interest in radio technology (and other facets of Amateur Radio). Often, involvement in Amateur Radio evolves from exposure to STEM - Science / Technology / Engineering / Math subjects, either from personal interest, or exposure during formal education. Individuals must study technical subjects to pass an Amateur Radio examination, must understand and uphold their responsibilities as licensed Amateur Radio Operators, and must even pay a modest fee to the FCC to obtain and renew their Amateur Radio License.

After obtaining one's Amateur Radio license, there is the expense of purchasing and operating Amateur Radio equipment (station) and other costs to participate in Amateur Radio activities such as paying dues to Amateur Radio clubs, and fees to travel to and attend Amateur Radio conferences.

In short, Amateur Radio Operators undergo *considerable commitment to being Amateur Radio Operators*. Voluntarily, and at some expense, self-educate themselves on subjects of radio technology.

Thus Amateur Radio Operators are ideal candidates for inclusion into the "Spectrum Workforce as explained in Strategic Objective 4.1:

> Preparing a well-trained U.S. workforce is essential to the policy proposals, potential investments in technologies, and research initiatives described in this Strategy. All stakeholders, including industry, academia, state, local and Tribal governments, as well as the Federal Government, must have a spectrum workforce with the necessary skills to work across current and emerging technologies.
>
> We must also prepare the spectrum workforce of the next generation for a globally competitive environment where innovation is a key to successful national economic growth and spectrum access in support of critical Federal missions.

and …

> **Attract, train, and grow the current and next- generation spectrum workforce.**
>
> …
>
> A well-trained workforce that can fill critical spectrum-related jobs across all relevant sectors is essential to ensuring that the spectrum ecosystem remains effective, efficient, and responsive to the evolving needs of the wireless ecosystem and society at large.

Yet… despite the obvious synergy of US Amateur Radio Operators voluntarily training themselves on radio technology…

There is no mention… whatsoever… or even a hint, vague reference, etc. to the existence of Amateur Radio in the Biden-Harris Administration's National Spectrum Strategy (NSS). That, despite the Amateur Radio Service being one of the radio services administered by the US Federal Communications Commission (FCC), and the FCC's involvement in the creation of the NSS:

> The Strategy reflects collaboration with the Federal Communications Commission (FCC), recognizing the FCC's unique responsibilities with respect to non-Federal uses of spectrum, and coordination with other Federal departments and agencies (referred to collectively here as "agencies").

The potential of Amateur Radio to accelerate the stated goals of Pillar 4, notably Strategic Objective 4.1:

> Attract, train, and grow the current and next-generation spectrum workforce.

and Strategic Objective 4.3:

> Improve the public's understanding of radio frequency spectrum and raise awareness of its role in everyday life.

… seems to have been overlooked, or ignored, or simply unknown. But …

Who… better???… to help realize these goals than US Amateur Radio Operators?

I have tried to make the case in Zero Retries *that the "Spectrum Workforce crisis" (using the verbiage of the National Spectrum Strategy) is very real*. That crisis is that much of the radio technology in the US such as mobile telephones, satellite communications and navigation, Wi-Fi, etc. that are now an integral, inseparable… part of our daily lives as a technological society, is increasingly developed and manufactured outside the US. Without a sufficiently large, well-qualified "Spectrum Workforce", the US is at a significant disadvantage in its use of radio technology developed in other countries… some of which are openly hostile to the US.

Document Concluding Section

And here's the concluding section of the document:

Editor's Concluding Thoughts

I feel that the Biden-Harris Administration's National Spectrum Strategy document and this "Pillar Four" panel discussion is a *critical "wake up call"* for US Amateur Radio to be seen as relevant in educational, vocational, and academic training in the US… and generally relevant in US society. Note that the panel discussion was narrowly focused on the subject of the use of radio technology (spectrum) and growing the base of those that are capable of developing and deploying radio technology. While STEM (Science, Technology, Engineering, Math) was mentioned organically and frequently in the panel discussion, if not for Phil Karn KA9Q's participation on the panel, any discussion of US Amateur Radio would have been entirely absent.

US Amateur Radio owes a debt to **Phil Karn KA9Q** for substantively representing US Amateur Radio on this panel, and making a reasonable case that Amateur Radio can be an element of education, and fomenting interest in radio technology and thus contribute to the "Spectrum Workforce".

US Amateur Radio also owes a debt to **Amateur Radio Digital Communications (ARDC)** for (presumably) sponsoring Karn's presence on this panel discussion, as well as its ongoing grantmaking to advance Amateur Radio and related activities such as sponsoring scholarships and Research and Development.

While there was no mention of Amateur Radio's potential for early education of the "Spectrum Workforce" in the National Spectrum Strategy, or mention of the ARRL during the panel discussion, ARRL posits:

Amateur Radio as Educational Tool Represented to Policymakers in Washington DC

that Amateur Radio spectrum ***not*** *being identified for reallocation or additional sharing* in the NSS was a result of significant behind-the-scenes work during the formation of the NSS. Thus US Amateur Radio owes a debt to **ARRL** for that work.

Future discussions of this topic will continue in **Zero Retries** newsletter, beginning with Zero Retries 0140, published on 2024-02-23. Earlier versions of the transcript appeared in Zero Retries 0138 (Part 1) and Zero Retires 0139 (Part 2).

My *Concluding* Conclusions

After wading through the National Spectrum Strategy (NSS) and listening (and laboriously transcribing… well, *editing*…) the transcript text over the past few weeks…

I wanted *to blame someone* involved with creation (and vetting) of the NSS, and the Symposium, and the Pillar 4 Panel Discussion, with not paying attention / not mentioning… all but ignoring (again, except for the contributions of Phil Karn KA9Q) *US Amateur Radio as part of the National Spectrum Strategy*.

But… with more time and more thought… *is there, really, reason to assign blame* for the omission of Amateur Radio in the NSS and near-total omission of Amateur Radio in the Symposium?

No.

I conclude that there is **not** any singular blame to be assigned for the omission of Amateur Radio in the NSS or the peripheral mentions of Amateur Radio in the Symposium.

In particular… my initial reaction was to "blame" the US Federal Communications Commission (FCC) for not promoting Amateur Radio (one of the radio services that they are charged to administer) as a potential pathway to participation in the "Spectrum Workforce". After mulling this over for most of this week, I've concluded that while the FCC *administers* US Amateur Radio, the administration of Amateur Radio (or any other of the many radio services) does not include *promotion* of any radio service the FCC administers. Simply, *"promotion" of a radio service is not a role assigned, or supported, of the (very busy) FCC*.

Nor can I assign any "blame" to the NTIA, NASA, or the numerous other organizations or programs that the panelists referred to, or the (non Amateur Radio) panelists for not mentioning Amateur Radio.

The only blame that I feel can *reasonably* be assigned for the omission of Amateur Radio in the National Spectrum Strategy is to *US Amateur Radio as a whole*.

While we in Amateur Radio:

- Amateur Radio Operators,
- Amateur Radio media (in all its forms),
- Amateur Radio vendors,
- Amateur Radio organizations,
- Amateur Radio's portrayal in non-Amateur Radio media (press, documentaries, entertainment),
- Amateur Radio's interactions with entities outside of Amateur Radio (such as with government agencies)…

… try to promote our favorite facets of Amateur Radio (or products), the sobering truth is that in the current era, Amateur Radio is perceived, almost completely, as a quaint, niche, hobby enjoyed by a small, aging, almost entirely male portion of the population. Thus, Amateur Radio is not very relevant to society.

In a word, Amateur Radio is insular. From Merriam-Webster:

> Characteristic of an isolated people
>
> especially : being, having, or reflecting a narrow provincial viewpoint

Largely, that describes Amateur Radio and Amateur Radio Operators. While we're usually enthusiastic about Amateur Radio… we do so *amongst ourselves*, to fellow Amateur Radio Operators, but far less to those who aren't Amateur Radio Operators. Because:

- *They* don't understand about tech and especially radio,
- *They* don't understand how cool DX or Packet Radio is,
- *They* think Amateur Radio is too much trouble / impractical / unnecessary,
- Etc.

So, it's no surprise that Amateur Radio is largely out of sight, out of mind, *out of relevance* in society.

I can hear the spluttering as you read this. But… *but*… ***but…*** *whaddabout*…

- Emergency Communications?
- Technological innovation in, and experimentation with radio technology?
- Involvement in STEM education?
- Other public service aspects such as assistance in finding sources of radio jamming?
- Good works by Amateur Radio organizations, such as scholarships?

All good points, but largely irrelevant with the overwhelming perception in society that Amateur Radio is individuals communicating amongst themselves using a quaint form of wireless that's become irrelevant in the modern era.

So… Amateur Radio is (perceived as) irrelevant… a quaint, but harmless anachronism.

Is that a bad thing? *Does it* ***matter****?*

One long-time advisor to Zero Retries posits that the societal perception of Amateur Radio doesn't matter. *They* got into Amateur Radio for the love of playing around with radios and the fun of reaching out with *their* radio to individually communicate with far-off places. Their point to me, repeatedly, is that *they don't care* about all the "external" perceptions of Amateur Radio. To them, Amateur Radio is merely a personal hobby, and the bigger picture is of no interest to them.

While that advisor's perception is valid, for them, I think it's shortsighted. Amateur Radio *only exists* (so that the advisor is *able* to enjoy it) because of the allocation of portions of spectrum for use by Amateur Radio. Those portions of spectrum *can be reassigned* to other uses (and have been - repeatedly) if those portions of spectrum are determined to have a better and higher use by other radio services and systems. The recent reallocation of Amateur Radio spectrum in the 3.5 GHz region is one example. Thus even if that advisor's perspective is valid, they're enjoying their hobby because of the contributions of previous generations of Amateur Radio Operators to create and preserve portions of spectrum for Amateur Radio use.

So… What Can… What Should… What *Could* We Do to Promote Amateur Radio in Society?

Honestly… *I don't know*.

The easy answer is that *"Amateur Radio" should start a public relations campaign to promote Amateur Radio*. But saying that is laughably ignorant of the realities:

- The current lack of "popular will" to do so within Amateur Radio,
- The "big lift" that would be required to "educate" Amateur Radio as a whole of the necessity to address this issue,
- The funding required for a coordinated campaign such as advertising, especially the skilled personnel that can work on this issue consistently,
- The coordination required amongst many subsets of Amateur Radio that don't regularly coordinate (us data fans don't often mingle with the hardcore DXers),
- Working with teachers and professors in technical colleges, community colleges, universities, etc. … *at scale*,
- Making Amateur Radio clubs more welcoming and developing more outreach in their communities.

Amateur Radio has been in "pullback" from general recognition in society for generations now. One of my benchmarks of Amateur Radio's recognition in society was when CQ, QST, and 73 Magazine were displayed in the "hobby" section of newsstands. 73 ceased publication decades ago now, and ARRL chose not to pay to have QST appear on newsstands, and CQ's print production has been problematic for years and now the parent company is probably out of business.

We could do something like a campaign to get ARRL's magazine "On The Air"[1] into libraries in the kid's sections (yes, they still exist, last I checked). But that's expensive and would require "someone" to fund it and coordinate it.

As a bare minimum start, I created a private, independent email list (no organizations) about "Future Amateur Radio". To start discussing that subject, I invited three prominent Amateur Radio Operators to participate. Only one did so… which I think is probably representative of the situation US Amateur Radio finds itself in. I plan to make more such invitations in the coming weeks, and I hope we can start some discussions there about what positive steps

can be made, or perhaps develop recommendations.

Lastly, this discussion wouldn't be complete without mention of the role of ARRL - "The National Association for [US] Amateur Radio". As tempting as it is to "beat up" on ARRL as being "missing in action" in Amateur Radio's "creeping irrelevance" in society, the reality is that ARRL is merely a reflection of US Amateur Radio and US society (which is another observation that my advisor made). Officers of the ARRL Board get voted in, and out. We as US Amateur Radio Operators, at least the few elect to be ARRL (increasingly expensive) dues-paying members, can choose to run for ARRL Board seats, or not, and exercise our vote in the ARRL elections that are competitive, or not.

This discussion also wouldn't be complete without mention of a relatively new factor in US Amateur Radio - Amateur Radio Digital Communications (ARDC) and its annual grant disbursements of ~$5M. Thanks to ARDC there is, potentially, funding available for Amateur Radio advocacy. But while ARDC has made it clear that it's not *their* role to do such advocacy (they're simply not structured, or chartered, to do so), ARDC has provided grants for other organizations to do such (similar) work.

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Power Amplifier Suitable for Software Defined Transmitters

By Steve Stroh N8GNJ

I have found a source of power amplifiers suitable for use with the very low transmit power of software defined transmitters (SDTx). From my perspective, this development makes it practical to consider the use of Software Defined Transceivers (SDTs) combined with these power amplifiers, for typical use in Amateur Radio, especially faster (wideband) Amateur Radio data communications enabled by Software Defined Radio technology.

I teased this development in **Zero Retries 0139**'s Request to Send:

> I finally identified a source for a key piece of hardware, the lack of which being generally available, has (in my opinion) been stifling progress on Amateur Radio technological innovation. It will take some time to tell that story, so it's deferred to the next issue of Zero Retries. But I'll say this:
> ***I… am… JAZZED… about this development!***

Since I discovered the wonder of SDTs being able to create near-infinite types of radios with a "universal" hardware widget and some software, and that such software is available as pre-built building blocks (GNU Radio) and even a graphical user interface to "drag and drop" the blocks (GNU Radio Companion), SDTs were simultaneously practical… and impractical.

Impractical is because SDTs such as the Analog Devices ADALM-PLUTO have transmit power levels about 10 milliwatts (10 mW). The low transmit power is understandable; not only are such devices generally regarded (and sold) as "lab equipment", but their power supply is minimal, such as a computer's USB port.

But, that's what *power amplifiers* are made for, right? Well, in Amateur Radio, a low power device is typically a portable radio that transmits 1 - 5 watts. Thus the 10 mW output of a SDT isn't nearly enough transmit power to drive a typical Amateur Radio power amplifier such as the RM ITALY VHF HT Linear Amplifiers LA-145:

> RF Input for Maximum Output: 3 watts

Thus, I've been on a quiet quest for either a reliable source of a "driver amplifier" that would boost the transmit power output of an SDT to a power level suitable to drive a power amplifier like the LA-145 to full output, or a power amplifier that can be driven to full power directly from the very low transmit power of a SDT.

No Reliable Source of Driver Amplifiers

Driver amplifiers exist, and are actually "easy to find" on eBay; a quick search found "20DB RF Amplifier 0.5-6 GHz" for US$10.99. But I'm… dubious… about such units from (effectively) unnamed sources. Dealing with such units on eBay comes with ample reasons for caution such as this notice in the listing for the above unit:

> Please note that the new type and old type of this product will be sent randomly, and make sure you will not mind before ordering.

My biggest plaint about eBay units is that even if you find one that is suitable, that works, there's no predictability that you would be able to find such a unit a second time, much less being able to recommend such a unit for others to purchase and be able to replicate the "Amateur Radio VHF / UHF Software Defined Transceiver - *with practical transmit power levels*" that I'm imagining.

If I could buy such a unit from a reliable Amateur Radio dealer at even 5x that price, I'd do so. But I have yet to find such a unit from a reliable dealer that has committed to supplying such units on a repeatable basis.

But, I think this quest is at an end.

Boulder Amateur Television Club TV Repeater's REPEATER Newsletter

I'm a fan of KH6HTV's newsletter for Amateur Radio Television, 155 issues to date, with all kinds of Zero Retries Interesting info about operating television in Amateur Radio (especially digital television) and the actual operation of a television repeater (and a club to support it) in the Boulder, Colorado area.

I excerpted a recent article from this newsletter in **Zero Retries 0139** - Q0-100 is Not a Ham Satellite. (What is it ?). Another recent interesting article in Issue 155 was the conclusion of significant testing of various antennas for Amateur Television use:

> **ATV Antennas - Wrap Up**

Jim, KH6HTV

We have finally finished our testing of 70 cm & 23 cm antennas for possible use in ATV service. Here is our list of recommended antennas.

KH6HTV Amplifiers

KH6HTV VIDEO Model 23-12 amplifier (for 1240 - 1300 MHz). Image courtesy of Jim Andrews KH6HTV.

Disclaimer: I have not purchased, nor have I tested the unit I'm about to describe. I plan to do so, but as of this writing, I have not yet done so.

Jim Andrews KH6HTV is a highly experienced electronics designer who has been building specialized amplifiers for use in Amateur Radio Television for more than a decade. When I saw mention of his amplifier products in his newsletter…

> KH6HTV Video is my retirement, ham shack, hobby business. My objective is to supply Amateur TeleVision (ATV) products to other ATV hams who are seeking an "appliance operator" solution, rather than "home-brewing" their own gear.

… it occurred to me that if these amplifiers were designed for wideband (up to 6 MHz) television use and high duty cycles, they might also be applicable for wideband *data* use.

For example, the Model 70-9B:

> The KH6HTV-VIDEO Model 70-9B, RF Power Amplifier is for use in the amateur radio 70cm band (420-450 MHz). It is a Class A-B amplifier designed for linear service. It can be used to produce a 70 Watt FM signal or 25 Watt (pep), analog, TV signal. It can also produce a 10 Watt (rms), high-definition (1080P), digital TV signal. The rf power output can be lowered -3 dB or -5 dB for reduced DC current draw with the front panel rotary switch. Provision is included for external PTT control. It is ideal for use as the final amplifier in a digital ATV repeater.

I emailed KH6HTV to ask what drive levels his amplifiers required, explaining my quest for an amplifier compatible with Software Defined Transmitters, and this was his reply:

> Amplifier Input requirements. All of my amplifiers have plenty of gain, more than sufficient to handle any of the low power SDR radios, such as you list, the Pluto, Lime & Pitaya. Check out the detailed spec. sheets. All of the amps have about 50dB or more gain.
>
> For example -- 100 Watts RF = +50dBm -- with 50dB of gain, this calculates out to require 0dBm, i.e. 1 mW of input drive rf power.
>
> It was a challenge to put that much gain in one box. Early prototypes became 80 Watt power oscillators before I discovered the engineering secrets. My amps are now stable and do not oscillate. They are all tested to verify stability.
>
> All of my amplifiers have a high power output stage, but they also include a built-in, low level, driver amplifier stage which allows for RF input power of < 1mW to drive the amp to full power output.
>
> I originally designed my amplifiers for analog TV service where they would be driven by CATV, NTSC modulators. Those modulators were used in the head end offices of the cable companies. They all put out typically a max. of 0dBm and some of them even less. So to use them and then boost the rf output to many watts really did require a whole lot of gain. Essentially the same situation you now are encountering with the various SDR rigs.
>
> Likewise, for our digital ATV today, the modulators which we purchase are similar in output to your SDRs. They too put out at most about +10dBm. Actually most are less than that. The digital ATV modulators drive my amps directly also.

So… wow! Finally a reliable supplier of a suitable amplifier that will work with Software Defined Transceivers, and based in the US.

Currently, KH6HTV manufactures transmit power amplifiers and receive pre-amplifiers for the Amateur Radio 70 cm (420 - 450 MHz) and 23 cm (1240 - 1300 MHz) bands.

When I discussed the potential of his amplifiers for use for wideband data modes, and the possibility that other bands might be able to do higher data speeds if the FCC does remove the bandwidth limits from all Amateur Radio VHF / UHF bands, and thus 1.25 cm (219 - 220 and 222 - 225 MHz) might become a band actively used for high speed data communications, KH6HTV replied:

> My amplifier design is rather universal. I could build amps similar to the 70-7, 70-9, and 23-11 for the 144, 220, 430, 915 or 1270 MHz band.
>
> The prices would all be similar, no matter which band.

Some details to consider in using KH6HTV's amplifiers with SDTs:

- KH6HTV's amplifiers are not inexpensive, but I consider his pricing reasonable - a good value proposition. I will purchase one (or more) when I am ready to begin building my Amateur Radio VHF / UHF Software Defined Transceiver unit.
- KH6HTV's amplifiers are unidirectional - they have an input and an output; they are not bidirectional, thus sharing a single antenna between the transmitter / amplifier output and the receiver input of an SDT must be carefully considered. (See note below.)
- KH6HTV's transmit power amplifiers do not have "transmit sensing". The amplifier begins amplification *only* when the "Push to Talk" (PTT) input is triggered, or the unit's "Xmit ON" switch is toggled. Thus there is the issue, in using a Software Defined Radio, of the SDTx providing a reliable PTT signal. Typically there's no PTT signal available on an SDT, so perhaps part of the Software of the SDT will have to integrate another piece of hardware (simple microcontroller with a USB connection on the same computer?) to provide the PTT signal that a KH6HTV amplifier requires.
- KH6HTV only builds his amplifiers for use by US Amateur Radio Operators:
  NOTICE: This linear amplifier is not FCC type accepted. Therefore, the use of this amplifier is only legal in the USA, amateur radio, 70 cm band (420 - 450 MHz) / 23 cm band (1240 - 1300 MHz). Owners and operators of this amplifier must be licensed amateur radio operators

As for the issue of a Software Defined Transceiver requiring isolation of the transmitter from the receiver (full duplex operation with no built in duplexer), I predict that an old technique for VHF / UHF operation will become popular again - crossband operation. Crossband operation is now easy and inexpensive by using Software Defined Receiver units *that can receive, wideband signals on all Amateur Radio VHF / UHF bands*. The Boulder, Colorado Amateur Television repeater operates crossband:

> Input frequencies are primary, 1243 MHz, 6 MHz BW, and secondary 441 MHz, 2 MHz BW & 6 MHz BW. The repeater automatically switches to any incoming TV signal. The 70 cm output is on 423 MHz, 6 MHz BW.

Thus one of my experiments will be to transmit on, for example, 440 MHz (with one of KH6HTV's amplifiers) and receive on 222 MHz with a SDRPlay

RSP1B. I can use a tri-band antenna such as the Comet CX-333 and associated triplexer with the transmitter connected to the 440 MHz port, and the receiver connected to the 220 MHz port.

That's the theory anyway… and it's been just that, a theory for way too long. *Now* with the existence of the KH6HTV amplifiers, VHF / UHF Software Defined Radio has gotten *practical* for me, and that's *exciting*!

Operating Amateur Radio *Video*

Also, I'm not ruling out the potential for using my future KH6HTV amplifier(s) for its originally intended purpose - video. Video is an interesting… um, "mode"… that could be potentially repurposed for data operations. It has long been discussed, quietly, that in the US Amateur Radio 70 cm (420-450 MHz) band that there is no restriction (other than small slivers for operations such as space, and informal band plans) of television signals that can occupy a 6 MHz channel… but "data" operation is constrained to a maximum 100 kHz channel. Thus it's been joked for decades now that if Amateur Radio data enthusiasts really wanted to have fun with wideband data modes in 420 - 450 MHz, one way to do so, within the "letter of the current regulations", would be to build a "television" repeater and find some clever way to encode "video" to justify the use of a channel wider than 100 kHz. One such method would be a system that transmits a data stream that regularly transmits digital photographs such as JPGs (slow scan video), with a "secondary" use of arbitrary data such as files, email, etc. Obviously it's preferable that such workarounds for operating wideband data modes on 420 - 450 MHz will, hopefully, soon not be required if the FCC eliminates bandwidth limits on the US Amateur Radio VHF / UHF bands as part of FCC Docket 16-239.

Indeed, in a followup email, KH6HTV made a very similar point that current digital television modes are *already, essentially, the digital bitstream that I imagine* in the previous paragraph:

> Hams Sending High Speed Data… Have you given any thought to what digital TV is all about? It really is also sending digital data bits, plus at very high data rates. The digital TV data stream is really a whole lot of addresses, data packets, bit error corrections, etc. What is different from [that] vs. "data"? Just that the data content is oriented towards video and audio vs. emails, etc.?
>
> High speed? You betcha. For example with our DVB-T digital video broadcast - terrestrial standard, using a 6 MHz wide TV channel and 64QAM constellation / modulation we pipe out data at a rate up to about 22 Mbps. In addition to sending video and audio, our modulators also provide the optional capability to send a secondary, independent data stream of lower speed data.

Framed that way, digital television is just another protocol impressed on a data stream.

All that said, I've not yet explored Amateur Radio video, but that *is* a mode that I consider *Zero Retries Interesting* and it's on the list for eventual experimentation in N8GNJ Labs, especially with this intriguing offer from KH6HTV:

> **Special Offer for Newcomers to ATV**
>
> If you are new to ATV and want to get started in high-definition, digital ATV, I offer you a special service. If you purchase an RF Linear Power Amplifier and combo receiver from me, I will purchase and then resell to you at cost, a Hi-Des Model HV-320E, DVB-T modulator. I will program both the modulator and receiver for you. Thus, when you receive the complete transmitter/receiver package, it will be ready to work immediately for you. Great KISS deal for turn-key, "appliance operators".

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

FCC Jobs Available for Electrical / Electronics Engineers

Federal Communications Commission's Facebook page:

> We value a diverse workforce, and our HR and Office of Engineering and Technology departments recently partnered with the University of New Mexico to recruit top-tier Honors Engineers into federal careers in Electronic Engineering through job fairs at Historically Black Colleges and Universities and Hispanic Serving Institutions. If you're an Electronic Engineering student set to graduate in May 2024, we invite you to apply for the Honors Engineers Program, with applications open through July 2, 2024. You can submit through USAjobs.gov at https://www.usajobs.gov/job/767902700.

If you are, or know of, a young person appropriate for these jobs, please do so. The FCC *desperately needs more technical knowledge* in the organization!

China Claims AI-powered Electronic Warfare Breakthrough

From Asia Times, by Gabriel Honrada, February 20, 2024:

> *Device reputedly capable of real-time monitoring and analysis of wider electromagnetic spectrum, key for decoding enemy signals and making battlefields transparent*.
>
> Chinese scientists claim to have developed an advanced military surveillance device that could significantly enhance China's electronic warfare capabilities, a high-tech realm where future conflicts will increasingly be fought and potentially decided, South China Morning Post (SCMP) reported.
>
> The device is small in size, high in performance and low in power consumption, the SCMP report said. It will allow the Chinese military to detect and lock on to enemy signals at unprecedented speeds, decode their physical parameters almost instantly and effectively suppress them

> while ensuring the smooth flow of their communications, the report said.
>
> The technology was previously considered a pipe dream due to the enormous amount of data to be processed in the heat of combat. However, Yang Kai, a professor from the School of Information and Electronics at the Beijing Institute of Technology and lead scientist on the project, gave SCMP a glimpse into the strides his team has reportedly made in the area.
>
> The real-time analysis bandwidth of traditional spectrum monitoring systems is generally restricted to a range of 40-160 MHz. However, the new Chinese equipment has supposedly extended the frequency range into the gigahertz zone, covering the frequency range used by ***amateur radio enthusiasts*** and even Elon Musk's Starlink satellites.

Yet another example of how inexpensive and *exponential* compute power is being used in radio technology to create capabilities that just weren't possible… or practical… even a few years ago. Extrapolating from stories like this that are being reported openly, it's not too hard to imagine what's happening on the bleeding edge of radio (and compute) technology, such as new semiconductor devices that are being created exclusively and secretly for military and government use.

The problem that this presents for the US (military) isn't to stay equivalent with such technological capabilities… its the ability to bring such capabilities into mainstream use in reasonable time and at reasonable cost. That takes a lot of talent in radio technology… see the first story in this issue.

Another Zero Retries Interesting Organization and Newsletter - N.E.W.S.

North East Weak Signals (N.E.W.S.) is a club in Longmeadow, Massachusetts USA with activities on VHF / UHF / Microwave bands. The club features regular meetings, an annual conference, and a Zero Retries Interesting newsletter that they make available for public access - the N.E.W.S. LETTER (clever!).

My thanks to Pseudostaffer Jeff Davis KE9V for mentioning this club's annual conference, from which I found the newsletter.

High Marks for Prototype Antenna System and Satellites

From **Amateur Radio Newsline** Report 2416 for Friday February 16th, 2024:

> PAUL/ANCHOR: An antenna system has received high marks for its ability to communicate with large numbers of satellites around the clock. Dave Parks WB8ODF gives us those details.
>
> DAVE: Tests of a digital phased array antenna system in Fairbanks, Alaska, showed it to be capable of handling more than 300 satellite contacts daily - and doing it around the clock, according to the company that developed it. In reporting the results on the 7th of February of its three months of testing, L3Harris Technologies said that the prototype system also demonstrated the ability to handle as many as eight contacts at the same time.
>
> L3Harris senior scientist Brian Haman later issued a statement saying that the company was very pleased with the results.
>
> L3Harris has said that this kind of technology will prove especially useful in helping to achieve simultaneous horizon-to-horizon communications. It is also able to reduce any RFI it locates. L3Harris developed the array in response to government and commercial customers' needs to reach constellations in different orbital planes as well as large constellations in low-Earth orbit.
>
> The research and development was done in agreement with the National Oceanic and Atmospheric Administration's Satellite and Information Service to develop a means of collecting data from an increasing number of satellites in a cost-effective way.
>
> This is Dave Parks WB8ODF.

[SPACENEWS.com story - L3Harris demonstrates digital phased array antenna system]

Phased array antenna systems seem almost seem magical… until you factor in the immense compute power that is now available to inexpensively compute the necessary excitation of amplitude and phase angles necessary for each element of an array of small antennas. Phased Array Antennas are finally beginning to trickle down to ordinary commercial, and almost to consumer use.

HamTV is Go for Launch!

ARISS on Mastodon:

ARISS engineers in the US and Europe worked hard to deliver all the equipment to NASA at the end of December.

Watch for information on ground station configuration and updates as it gets closer to integration on the International Space Station.

If memory serves, video transmissions from this unit will be digital, not analog.

VHF Communications Magazine - Now in DLARC

VHF Communications was one of my favorite magazines in my Amateur Radio career. It was published between 1969 and 2013 and I would buy it when I would occasionally see an issue for sale at a hamfest, but I never did quite go to the trouble and expense of subscribing. But I learned a lot, over time, from each issue that I got my hands on.

Now *all* of VHF Communications is available on Digital Library of Amateur Radio & Communications (DLARC):

> VHF Communications was published from 1969 and 2013. It focused on the VHF, UHF, and microwave bands. It was spun off from UKW Berichte, a German radio magazine. It is included in DLARC with the permission of publisher Andy Barter.

When a beloved publication like VHFC becomes available in DLARC, I do my favorite search, "Packet Radio", and wow, there was a lot of good stuff. My favorite (again, from a very quick search):

Updating the AX.25 network in Slovenia. Radio transceivers for the new Non-Flawless Protocol (NBP) Network by Matjaz Vidmar, S53MV, 2013-02, pages 106 - 117.

> The AX.25 protocol was defined around 1980, shortly after the successful Vancouver experiments. From the protocol point-of-view, AX.25 used amateur radio callsigns as addresses in an otherwise very similar protocol to other professional protocols.
>
> From the amateur radio point of view, AX.25 was the first widespread protocol to allow automatic networking in place of simple point-to-point contacts. The AX.25 built-in but inefficient "digipeater" was soon replaced by many different AX.25 network nodes developed all around the world.
>
> AX.25 arrived in Slovenia around 1985. Initially all contacts were made on a single frequency 144.675MHz using narrow band, voice grade NBFM (15kHz) radios with Bell-202 AFSK modems. A single 1200bps_ channel only allowed hand typed chatting. Increasing the number of channels and installing 70cm band interlinks among nodes only brought minor improvements.
>
> The first decision was simple. In 1988 simple WBFM radios operating in the 23cm amateur band were developed, where "wide band" means 230kHz filters as used in broadcast FM receivers. These radios allowed a 38400bps network backbone with simple Manchester modems.
>
> This article was taken from part of Matjaz Vidmar's web site [1] and describes the new transceivers designed for a major upgrade to the Slovenian AX.25 network using a new version of the AX.25 protocol. The new protocol is described in detail on the web site.

The article provides ample descriptions about the hardware that operates at 2 Mbps, including block diagrams, some circuit diagrams, etc. This is the kind of material that could be a building block for a software implementation of a similar "radio" within a Software Defined Transceiver. The web pages at the end of the article are no longer online, but S53MV's current web page is https://s53mv.s56g.net/

… which led me to the article Ne-Brezhibni Protokol (Non-Flawless Protocol). "NBP" was mentioned in the article above, but that linked article was no longer online. Fortunately S53MV put the complete article online, lavishly illustrated for easier understanding.

> The main requirement for a new amateur packet-radio protocol is to make radio links as reliable as wire links. Any other requirements should be met by higher-layer protocols at the discretion of the end users, thus allowing as much experimentation as possible. The new protocol was named "Ne-Brezhibni Protokol" (NBP) meaning Non-Flawless Protocol.
>
> NBP uses two different type of frames over a radio link: a data frame and an acknowledge frame. A NBP data frame includes a 32-bit tag field, two address paths, a payload and a CRC. In a radio transmission, carefully chosen 32-bit pseudo-random numbers (PRNs) are used as 32-bit tags to uniquely identify a particular data frame on a particular radio segment of the network. The same PRN is used for the initial transmission and for any retries of the same data frame.
>
> The correct reception of a data frame is acknowledged by replying with the same PRN. The NBP acknowledge frame only contains the PRN, one single address (acknowledges may be sent to the broadcast address ALL) and the CRC.

Wow… *reading more about NBP* is quite the rabbit-hole that I briefly fell down. Now bookmarked / "pinned tab" for in-depth reading.

This is just a smidgen of the fascinating information that is surfacing in DLARC!

Leave a comment

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Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing ***Thanks*** to:

- Tina Stroh KD7WSF for, well, *everything!*
- ***Founding Members*** **who generously support Zero Retries financially:**
  Founding Member 0000 - Steven Davidson K3FZT
  Founding Member 0001 - Prefers to Remain Anonymous 01

  Founding Member 0002 - Chris Osburn KD7DVD

Founding Member 0003 - Don Rotolo N2IRZ
Founding Member 0004 - William Arcand W1WRA
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- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your QRZ page (or other web presence) and include a link:

  https://www.zeroretries.org

- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
  Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- Dan Romanchik KB6NU mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- Jeff Davis KE9V also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- Amateur Radio Weekly by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- Experimental Radio News by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- RTL-SDR Blog - *Excellent* coverage of Software Defined Radio units.
- TAPR Packet Status Register has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- HB9BLA Wireless by Andreas Spiess HB9BLA
- KM6LYW Radio by Craig Lamparter KM6LYW (home of the DigiPi project)
- Modern Ham by Billy Penley KN4MKB
- Tech Minds by Matthew Miller M0DQW

Zero Retries is currently using the Substack email publishing platform to publish Zero Retries. It's particularly suitable for small newsletters as you can get started for no cost.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join ***1300+*** other subscribers:

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Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

Zero Retries / N8GNJ on Mastodon

Zero Retries (N8GNJ) is also on Bluesky — @n8gnj — just click:

Zero Retries / N8GNJ on Bluesky

Email issues of Zero Retries are “instrumented” by Substack to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- SuperPacket blog — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- N8GNJ blog — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ / WRPS598 (He / Him / His)
These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA, and linked to the Internet via **Starlink *Satellite* Internet Access**.

2024-02-23

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1

Apparently so unimportant, compared to “National Contest Journal” and “QEX”, this magazine doesn’t even rate a picture on the ARRL “Magazines” page.